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UNITED STATES MARINE CORPS  
Marine Corps Schools  
Quantico, Virginia

46/4A/CIC:cem  
51-60-01

FEB 26 1963

From: Coordinator, Marine Corps Landing Force Development Activities,  
Marine Corps Schools, Quantico, Virginia  
To: Commandant of the Marine Corps

Subj: Air Conditioning Equipment for Pilot Full-Pressure Suits, Project  
No. 51-60-01, Final Report

Ref: (a) CMC Proj Dir AAJ-2-hph 51-60-01 to CMCS (CMCLFDA) of 5 Oct 60  
(b) CNO ltr Op 72201/ns Serial: 1411P72 of 27 Oct 1961, Develop-  
ment Characteristic No. CA-17501-8 and No. CA-17501-9

Encl: (1) Figures 1 through 6

1. INTRODUCTION

a. Purpose

(1) Reference (a) established Project 51-60-01 for the purpose  
of conducting a service test in order to determine:

(a) The requirement for air conditioning flight personnel  
when wearing full pressure flight suits during expeditionary deployment.

(b) The type of air conditioning equipment most desirable  
and the quantities required to fulfill the above requirement.

b. Background

(1) Certain Navy and Marine Corps Air Stations are presently  
being provided air conditioned ready-rooms and pilot transporter air  
conditioning equipment for use by pilots utilizing the pilot full-pressure  
suits. These station type units could provide adequate air conditioning  
for pilot full-pressure suits, when aviation units are deployed; however,  
their weight and cube is considered excessive for expeditionary purposes.  
In order to determine the most desirable types of air conditioning equip-  
ment for deployed aviation units, the following four expeditionary type  
units were procured for test and evaluation:

(a) The HAC-12, a 12 outlet conditioned air supply unit,  
manufactured by Harvey W. Hottel Inc., Silver Springs, Maryland.

(b) The Mobile Expeditionary pressure suit cooler, a self-  
contained gasoline engine driven suit air conditioning unit manufactured  
by Wald Research Inc., Mahaw, New Jersey.

(c) The HD-101, a suit drying unit manufactured by Harvey W.  
Hottel Inc., Silver Spring, Maryland.

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(d) The Portable P/N AJS-1400-1, a hand-held single outlet portable liquid oxygen ventilating unit manufactured by A. J. Sawyer Co.

c. Description

(1) General - The four expeditionary units have the following general characteristics:

(a) The HAC-12 is a 12-outlet conditioned air supply unit, designed for cooling suited air crew members during briefing and standby periods. This unit is  $63\frac{1}{2}$  inches wide,  $76\frac{1}{2}$  inches high, and  $30\frac{1}{2}$  inches deep and weighs approximately 1,500 pounds. It is electric motor driven, skid mounted and designed for installation outside of a briefing shelter. Its outlets provide cool dry air to twelve full pressure suits worn by pilots during briefings. This unit also has a suit drying capability. (See enclosure (1), figure (1)).

(b) The Mobile Expeditionary Pressure Suit Cooler-1 is an 8-outlet self-contained gasoline engine driven air conditioning unit, designed for cooling suited air crew members while they are being transported to and from aircraft. The test unit was trailer mounted (See enclosure (1), figure (2)). It is 84 inches wide, 53 inches high, 60 inches long and weighs approximately 800 pounds.

(c) The HD-101 is a suit drying unit designed for drying a single pressure suit and was evaluated in conjunction with the HAC-12 air conditioning unit. This unit is approximately 36 inches long, 24 inches wide and 24 inches high and weighs approximately 200 pounds. It is electrically driven and is designed to be used inside a shelter. (See enclosure (1), figures (3) and (4)).

(d) The hand portable P/N AJS-1400-1 ventilating unit is a hand-held portable liquid oxygen ventilating unit. This unit is a single outlet conditioning air supply designed for cooling a suited air crew member during transport to and from aircraft and during standby periods. When filled with liquid oxygen, it bleeds off at a rate sufficient to air condition its bearer. A single on-off control valve controls the rate of flow. (See enclosure (1), figures (5) and (6)).

2. RESULTS OF TEST

a. The HAC-12 is a satisfactory item of equipment for air con-

ditioning air crews during briefing and standby periods. The unit is rugged and reliable with an operating life of at least 1200 hours. It requires little maintenance. The unit is readily transportable in all standard section "M" vehicles and is capable of being transported by helicopters. No specialized personnel are required to operate this unit. This unit has two minor deficiencies in that the carbon filter tends to break up, allowing particles to enter the suit pressure system and the cables from the control box to the unit are too short. These deficiencies are easily corrected by eliminating the carbon filter and by increasing the length of the cables from 15 feet to 25 feet.

b. The Mobile Expeditionary Pressure Suit Cooler-1 is considered to be an unsatisfactory item of equipment. It was subject to constant breakdowns and was seriously deficient in its capability to provide cooling air to the pilots' pressure suits. In addition, the trailer mounted unit is unstable due to an aft center of gravity. This condition is readily apparent when the unit is being attached to tow vehicles.

c. The HD-101 suit drying unit is satisfactory for drying pressure suits. The unit is easily handled. It is capable of drying pressure suits in 15 to 20 minutes with no apparent damage to the suits. The unit is easily transportable in all standard section "M" vehicles and by helicopters. No maintenance problems were encountered and no specialized personnel are necessary to operate this unit. This unit had two minor deficiencies. The timer was inaccurate, and the hinge plate required reinforcing to hold the arm and leg ducts in the down position when the pressure suit is on the ducts.

d. The hand portable P/N AJS-1400-1 is a satisfactory item of equipment for cooling a suited air crew member during transport to and from aircraft and during standby periods. In use, the unit has an operation duration of one hour. When filled and not in use, the unit will deplete itself in 4.5 hours through evaporation. Routine servicing expends approximately one (1) liter of liquid oxygen due to venting and overflow during each refill. No maintenance problems were encountered and no specialized personnel are necessary to operate it.

### 3. CONCLUSIONS

a. As a result of the tests by the Marine Corps Landing Force Development Center; Marine Aircraft Group 24, Marine Corps Air Station, Cherry Point, North Carolina; and Marine Aircraft Group 32, 2d Marine Aircraft Wing, Marine Corps Air Station, Beaufort, South Carolina, it is

concluded that:

(1) the HAC-12 is a satisfactory item of equipment for air conditioning air crews during briefing and standby periods. It is reliable, rugged and requires little maintenance. It is readily transportable in all standard section "M" vehicles.

(2) the Mobile Expeditionary Pressure Suit Cooler is an unsatisfactory item of equipment.

(3) the HD-101 suit drying unit is a satisfactory item of equipment for drying pressure suits. It is rugged, reliable and requires little maintenance. The unit is easily transportable in all standard section "M" vehicles.

(4) the hand portable P/N AJS-1400-1 is a satisfactory item of equipment for cooling a suited air crew member during transport to and from aircraft and during standby periods. It generally satisfies the requirement as stated in reference (b); however, it also places an additional burden upon the already overloaded liquid oxygen generating capability of the Marine Aircraft Wing. However, its excellent expeditionary characteristics and the satisfactory performance of this unit during tests tend to outweigh the above disadvantage.

#### 4. RECOMMENDATIONS

a. Based upon the results of tests, it is recommended that:

(1) the HAC-12 not be purchased for Marine Corps use until the pilot ready room vans being procured for test in the SATS environment are evaluated. Although these vans have only an eight outlet system, it is recommended that the pressure suit air conditioning units that are provided for these vans, be of the same quality and durability as that of the HAC-12. It is however recommended that the HAC-12 units be retained in their present location for continued use.

(2) the Mobile Expeditionary Pressure Suit Cooler-1 not be procured for Marine Corps use, and that those on hand be disposed of by the present testing commands in the best interests of the Marine Corps.

(3) the HD-101 Pressure Suit Dryer be procured for Marine Corps use with an allowance of one (1) unit per fifteen suits. It is also recommended that one (1) HD-101 Pressure Suit Dryer be procured

for the Pilot Dressing Room Van being procured in response to reference (b). It is further recommended that the HD-101 dryer located at Quantico be shipped to the Second Marine Aircraft Wing for use during deployments.

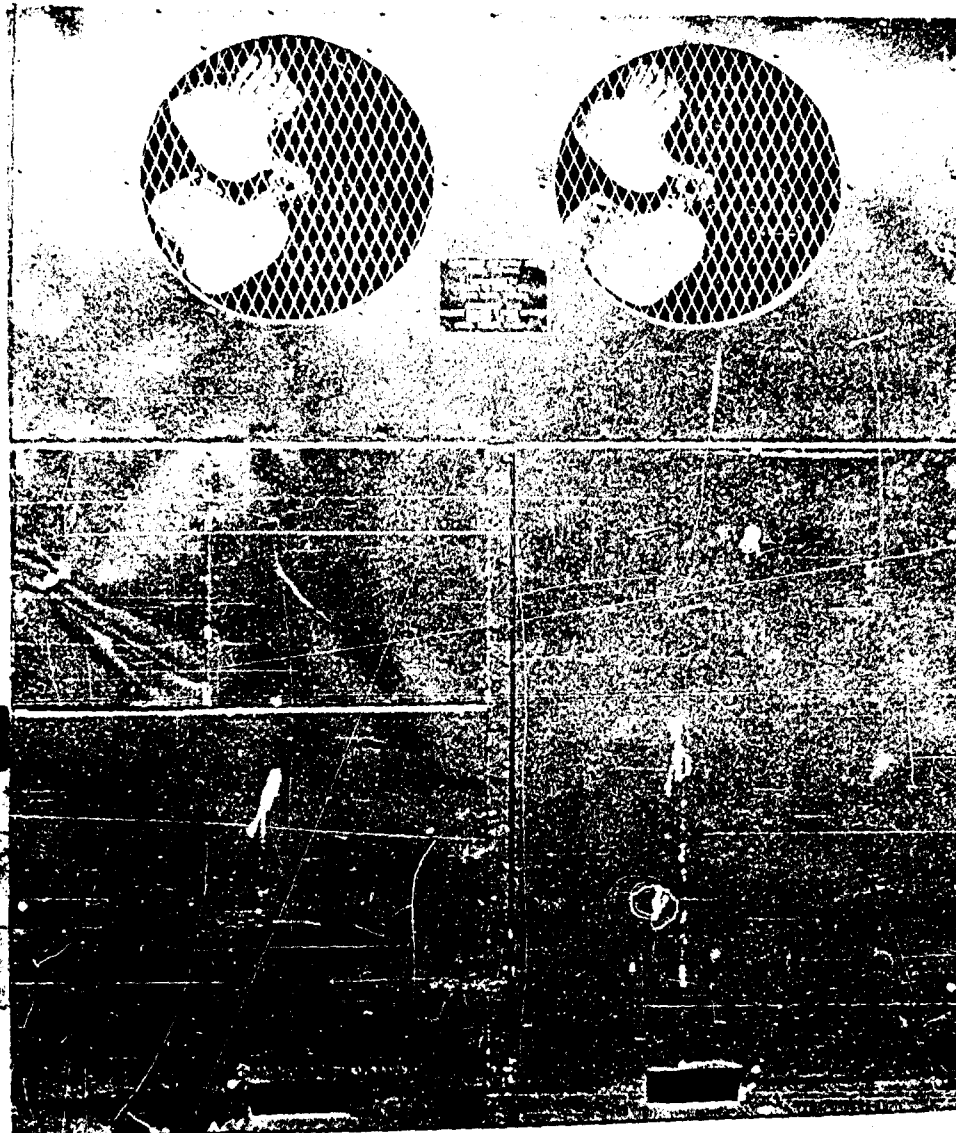
(4) the Hand Portable P/N AJS-1400-1 Ventilating Unit be procured for Marine Corps use, with an allowance of one per aircraft seat requiring the full pressure suit. It is further recommended that the P/N AJS-1400-1 Ventilating Unit presently located at the Second Marine Aircraft Wing be retained at its present location.

(5) Project 51-60-01 be terminated.

R.B. WILDE

By direction

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CMC (AX) (6)  
CMC (CSY)  
CG, FMFLant  
CG, FMFPac  
CG, MCSA, Phila, Pa. (Code 830)  
Chief, BuWeps (Code SEEC-45) (4)  
ASTIA (10)  
CG, 2d MAW



Model HAC 12 P-MC

ENCLOSURE (1)

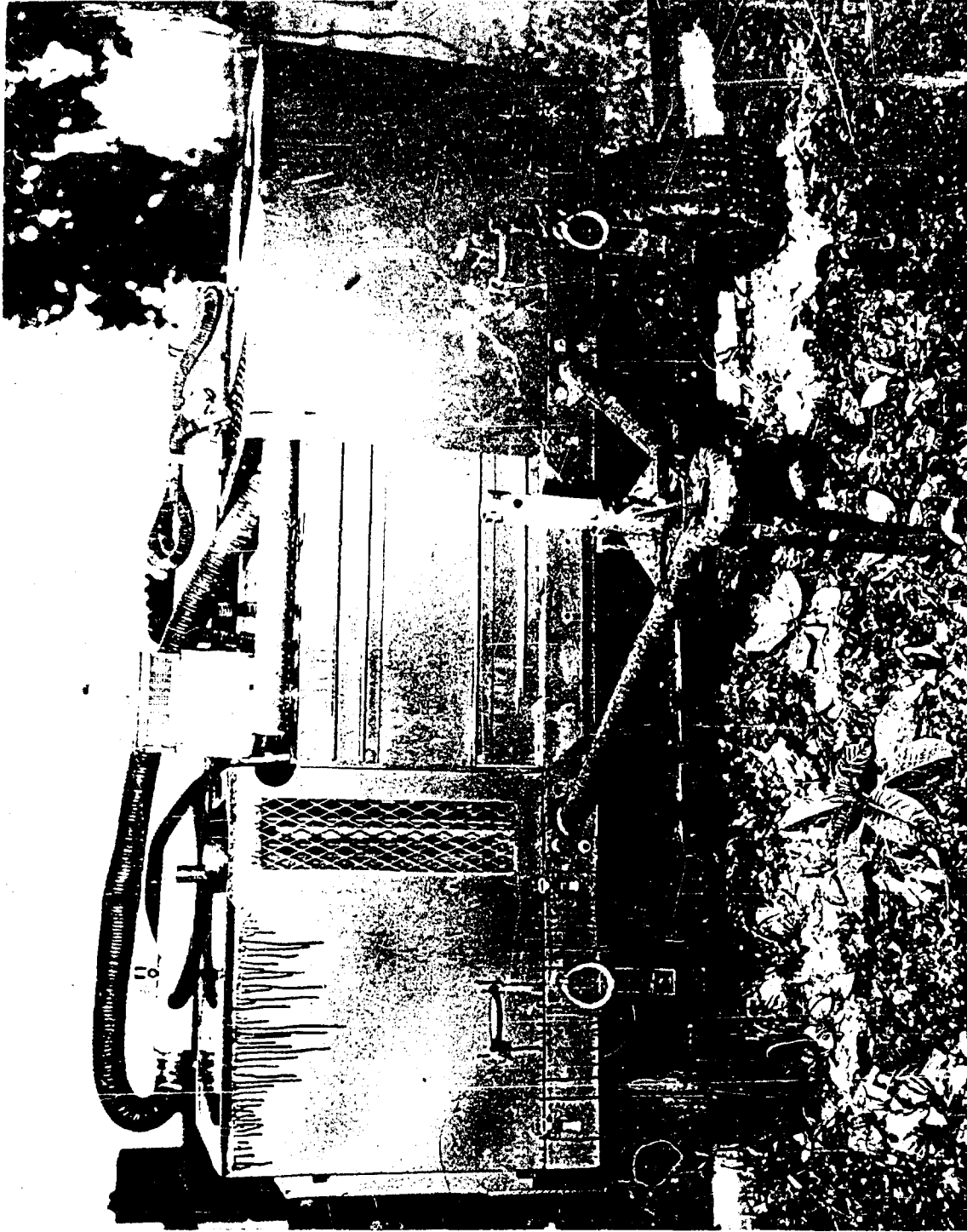
MARINE  
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QUANTICO,  
PROJECT NO. 51-60-01  
PAGE 1



CORPS  
BOARD  
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FIG. 1

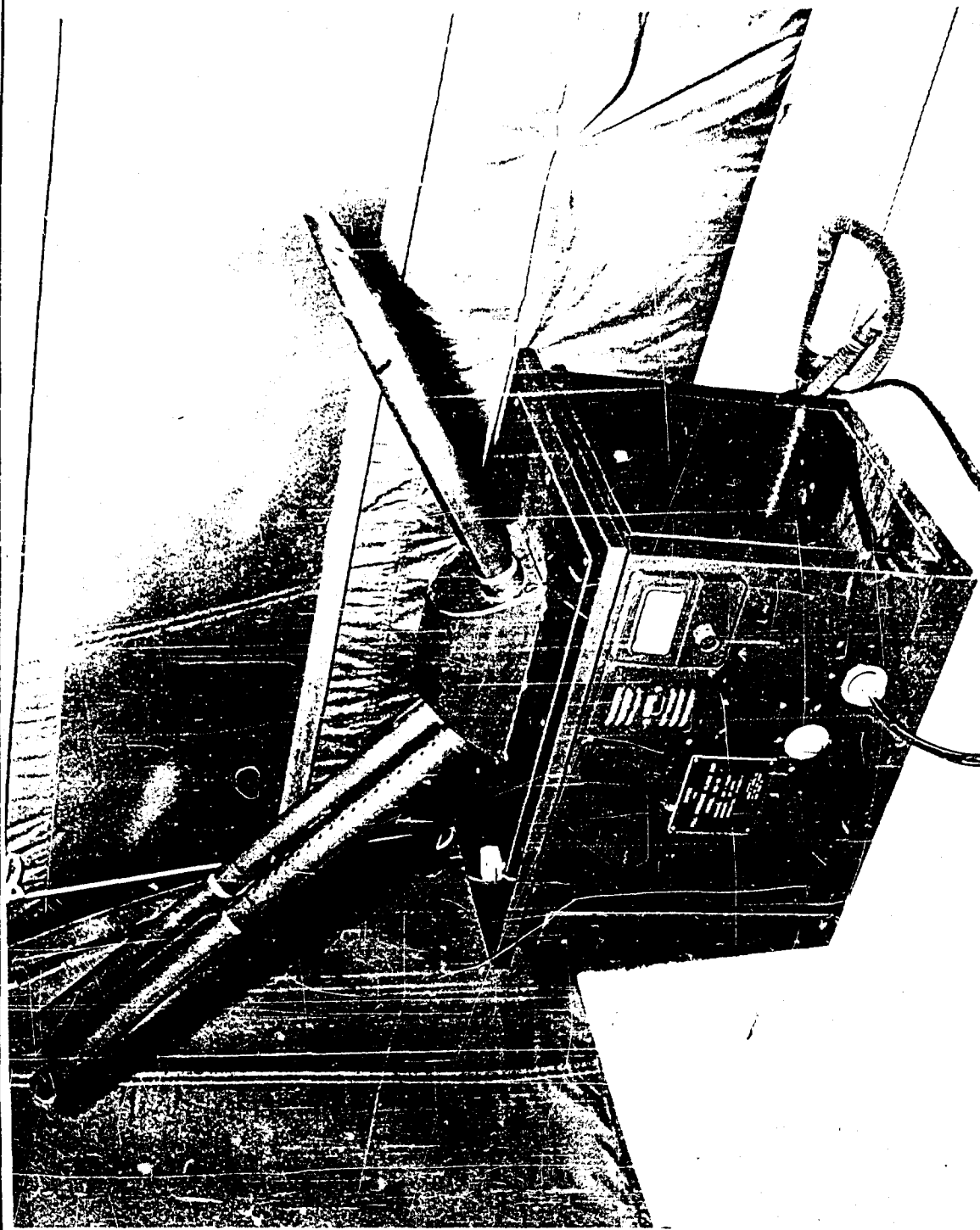




The Mobile Expeditionary Pressure Suit Cooler-1

ENCLOSURE (1)

MARINE CORPS  
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PAGE 2 FIG. 2



Dryer for Full Pressure Flying Suit Model HD-10

ENCLOSURE (1)

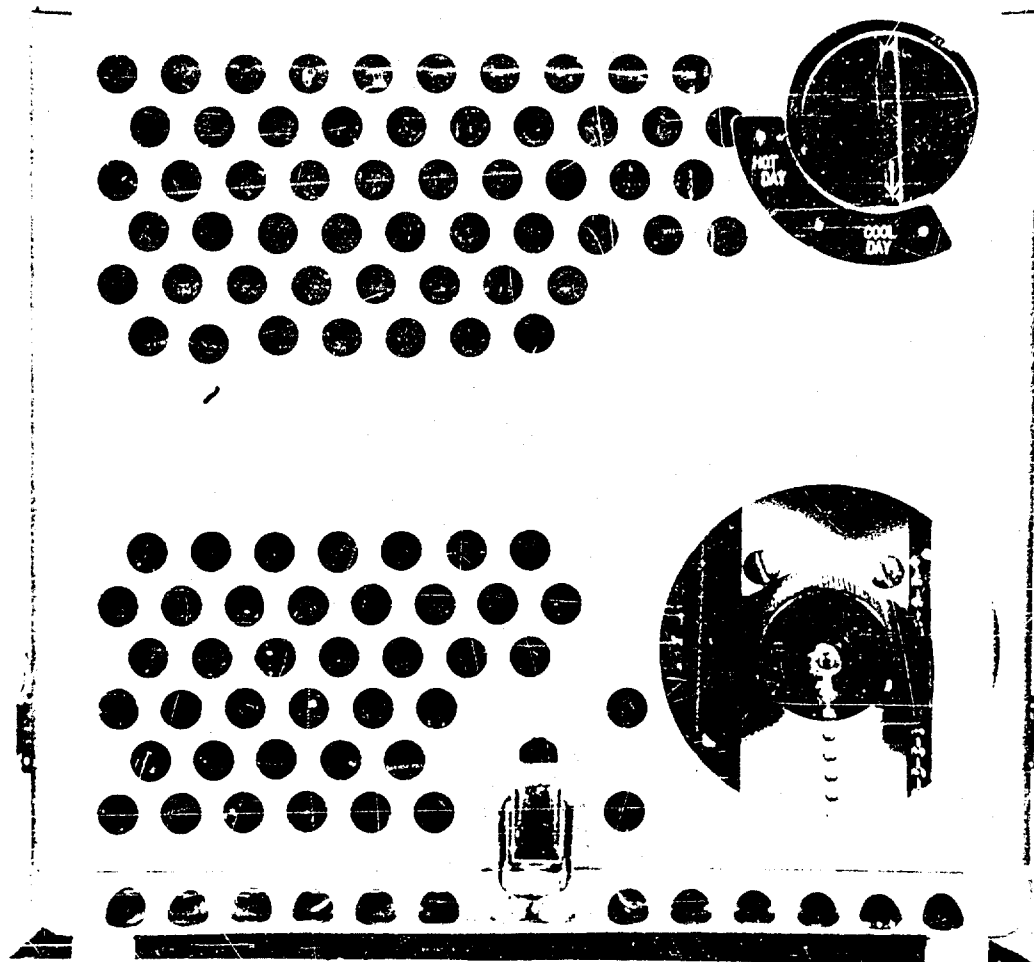
MARINE CORPS  
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MARINE CORPS  
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FIG. 1

Full Pressure Flying Suit on Dryer

ENCLOSURE (1)



Hand-held portable liquid oxygen ventilating unit. Front View.

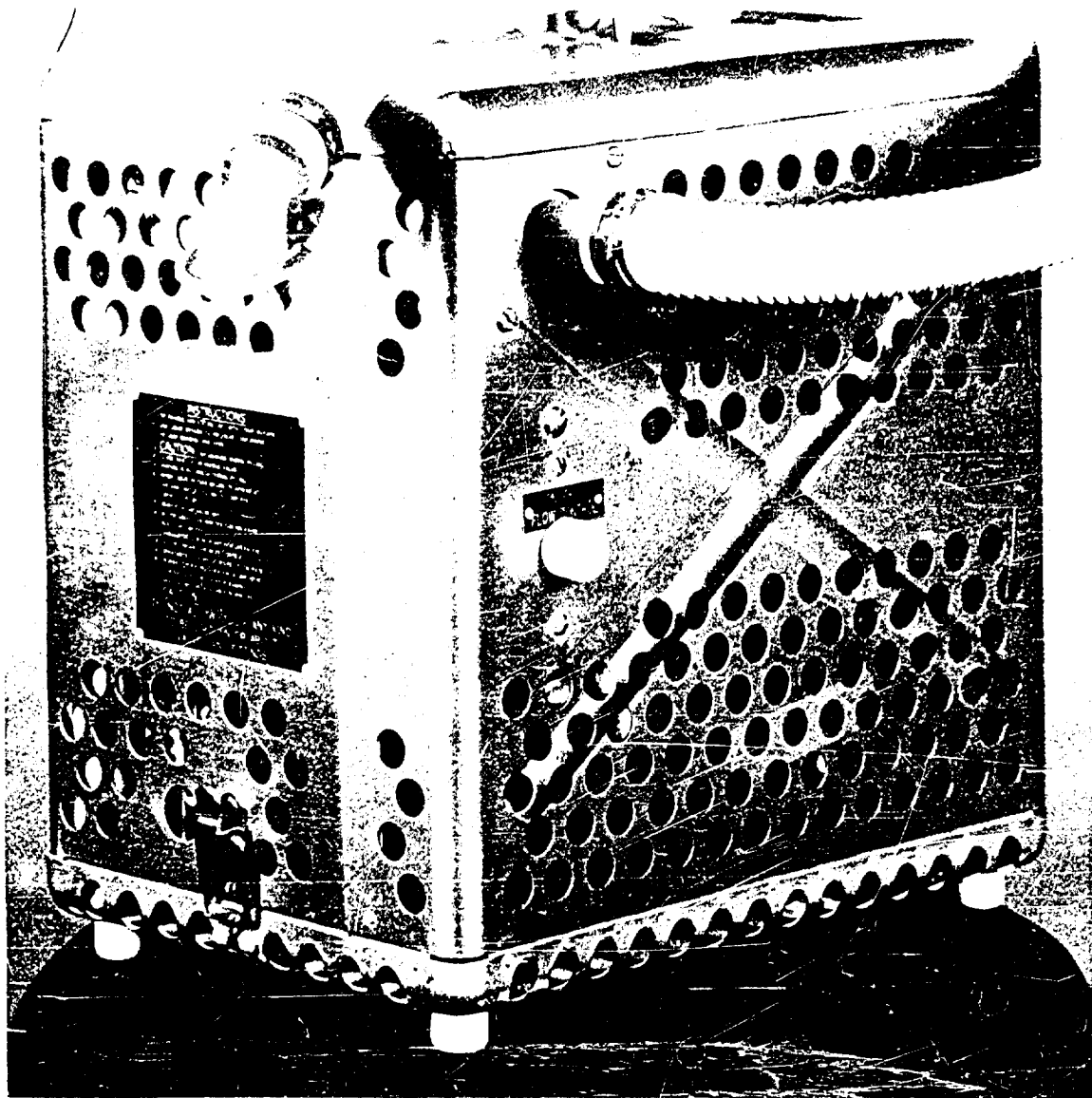
ENCLOSURE (1)

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FIG. 5



Hand-held portable liquid oxygen ventilating unit. Corner View.

ENCLOSURE (1)

MARINE EQUIPMENT QUANTICO, PROJECT NO.		CORPS BOARD VA.
PAGE 6	51-60-01	FIG. 6